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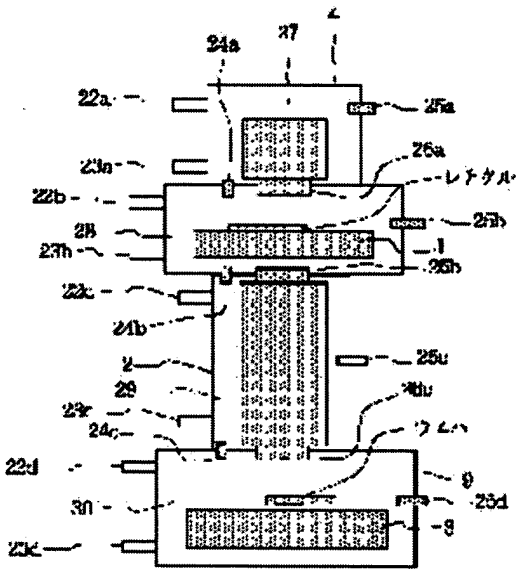
(54) ALIGNER, METHOD OF MANUFACTURING DEVICE, SEMICONDUCTOR MANUFACTURING PLANT, AND METHOD FOR MAINTAINING ALIGNER

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the deformation of the end faces of purging spaces like the end face of a projection optical system in a partially purged aligner.

SOLUTION: The aligner which exposes the pattern of an original plate to a substrate by using the exposing light emitted from a laser light source is provided with a plurality of purging spaces which are demarcated by enclosures having exposing light-permeable boundary members in the optical path between the laser light source and substrate and a pressure adjusting means which controls the pressure in each purging space so that the pressure may become a prescribed value.



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CLAIMS

[Claim(s)]
[Claim 1] The aligner for exposing the pattern of the original edition to a substrate characterized by providing the following. Two or more cases which adjoined for the wrap reason and were prepared in a part of optical path [at least] of exposure light. The member of the exposure light-transmission nature prepared in the boundary of a this adjoining case. The gas supply system which supplies purge gas in each of this case. The pressure sensor which detects the pressure in each of this case, and the control unit which controls this gas supply system based on the output of this pressure sensor to become a predetermined pressure about the pressure in each of this case, respectively.
[Claim 2] The aligner for exposing the pattern of the original edition to a substrate characterized by providing the following. Two or more cases which adjoined for the wrap reason and were prepared in a part of optical path [at least] of exposure light. The member of the exposure light-transmission nature prepared in the boundary of a this adjoining case. The gas supply system which supplies purge gas in each of this case. The control unit which controls this gas supply system based on the output of the differential pressure sensor which detects the difference of the pressure in a this adjoining case, and this differential pressure sensor to become a predetermined pressure about the pressure in each of this case, respectively.
[Claim 3] The aforementioned gas supply system is an aligner according to claim 1 characterized by being what operates the aforementioned air-conditioning machine so that it may have the air-conditioning machine in which the air supply of the purge gas to each case and exhaust air of the gas inside each case are possible and the measurement value by the aforementioned pressure sensor may serve as the aforementioned predetermined pressure.
[Claim 4] The aforementioned gas supply system is an aligner according to claim 2 characterized by being what operates the aforementioned air-conditioning machine so that it may have the air-conditioning machine in which the air supply of the purge gas to each case and exhaust air of the gas inside each case are possible and the measurement value by the aforementioned differential pressure sensor may serve as the aforementioned predetermined differential pressure.
[Claim 5] The aforementioned case is an aligner given in any 1 term of the claims 1-4 characterized by having at least one of the drive-system space containing the optical-system space and driving member containing an optical-system member.
[Claim 6] The aligner according to claim 5 characterized by being at least one of the projection-optical-system space for projecting the pattern of the lighting optical-system space for the aforementioned optical-system space irradiating the leading-about optical-system space for drawing the exposure light from the light source in equipment, and the aforementioned exposure light at the aforementioned original edition, and the aforementioned original edition on the aforementioned substrate.
[Claim 7] The aligner according to claim 5 or 6 characterized by having at least one of the masking-blade space containing substrate stage space and a masking blade including the original edition stage space where the aforementioned drive-system space includes the original edition stage in which the aforementioned original edition is carried, and the substrate stage in which the aforementioned substrate

is carried.
[Claim 8] An aligner given in any 1 term of the claims 5-7 characterized by for the aforementioned optical-system space being helium atmosphere, and the aforementioned drive-system space being N2 atmosphere.
[Claim 9] An aligner given in any 1 term of the claims 6-8 characterized by controlling so that the internal pressure of the aforementioned projection-optical-system space is maintained uniformly.
[Claim 10] An aligner given in any 1 term of the claims 1-9 characterized by maintaining the purge space where high cleanliness is demanded among the aforementioned purge space to a pressure higher than other adjoining purge space.
[Claim 11] The aforementioned air-conditioning machine is an aligner given in any 1 term of the claims 3-10 characterized by being what has a control valve for controlling the ratio of the amount of supply and displacement of the aforementioned inert-gas purge gas, and adjusts the pressure in the aforementioned case by this control valve.
[Claim 12] the above by differential pressure with the pressure in the case which the pressure in the aforementioned case adjoins -- an aligner given in any 1 term of the claims 1-11 characterized by being controlled so that the deformation of a member becomes within limits which do not have significant influence on optical-character ability
[Claim 13] An aligner given in any 1 term of the claims 1-12 characterized by a laser light source being a fluorine excimer laser.
[Claim 14] An aligner given in any 1 term of the claims 1-13 characterized by the aforementioned purge gas being inert gas.
[Claim 15] The device manufacture method characterized by having the process which installs the manufacturing installation group containing an aligner according to claim 1 to 14 for [various] processes in a semiconductor plant, and the process which manufactures a semiconductor device by multiple processes using this manufacturing installation group.
[Claim 16] The method according to claim 15 of having further the process which connects the aforementioned manufacturing installation group by the Local Area Network, and the process which carries out data communication of the information about at least one set of the aforementioned manufacturing installation group between the aforementioned Local Area Network and the external network besides the aforementioned semiconductor plant.
[Claim 17] The method according to claim 15 of carrying out data communication through the aforementioned external network between semiconductor plants other than the aforementioned semiconductor plant, and performing a production control, or it accesses the database which the vender or user of the aforementioned aligner offers through the aforementioned external network and acquires the maintenance information on the aforementioned manufacturing installation by data communication.
[Claim 18] The semiconductor plant which made it possible to have the gateway made accessible to the external network outside works, and to carry out data communication of the information about at least one set of the aforementioned manufacturing installation group to it from the Local Area Network which connects the manufacturing installation group and this manufacturing installation group for [containing an aligner according to claim 1 to 14 / various] processes, and this Local Area Network.
[Claim 19] Maintenance procedure of the aligner according to claim 1 to 14 installed in the semiconductor plant characterized by providing the following. The process which the vender or user of the aforementioned aligner provides with the maintenance database connected to the external network of a semiconductor plant. The process to which access to the aforementioned maintenance database is permitted through the aforementioned external network from the inside of the aforementioned semiconductor plant. The process which transmits the maintenance information accumulated at the aforementioned maintenance database to a semiconductor plant side through the aforementioned external network.
[Claim 20] The aligner which made it possible to have further a display, a network interface, and the computer that performs software for networks in an aligner according to claim 1 to 14, and to carry out data communication of the maintenance information on an aligner through a computer network.

[Claim 21] The aforementioned software for networks is equipment according to claim 20 which makes it possible to offer the user interface for accessing the maintenance database which connects with the external network of the works in which the aforementioned aligner was installed, and the vender or user of the aforementioned aligner offers on the aforementioned display, and to acquire information from this database through the aforementioned external network.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] About the maintenance procedure of the semiconductor plant which installed the device manufacture method of manufacturing a semiconductor device by the aligner and this aligner, and this aligner, and this aligner, especially an exposure optical axis is divided by two or more space, and this invention relates to the aligner by which these are purged independently.
[0002]
[Description of the Prior Art] In manufacture of a semiconductor device in recent years, the inclination which shortens wavelength of the exposure light source used for an aligner is remarkable. It is because the resolution of the projection exposure system which exposes wavelength by shortening goes up and exposure of a more detailed pattern is attained. For example, since a fluorine excimer laser has wavelength as short as 157nm, application to an aligner is advanced. However, the exposure light by this fluorine excimer laser is O2. Since it will be absorbed in H2 O atmosphere, it is necessary to purge the space through which exposure light passes by the inert gas.
[0003] Therefore, the method which installs the whole exposure machine in the high chamber of sealing nature, the method divided and purged to some are adopted.
[0004]
[Problem(s) to be Solved by the Invention] However, when adopting the method divided and purged, in order to control independently for every portion, the pressure differential arose between each portions and there was a trouble that this led to deformation of the boundary of each portion. Since this border area consists of members which penetrate exposure light, very small deformation of a member also causes [of exposure aberration] degradation.
[0005] The technical problem of the above-mentioned conventional technology is solved, and this invention aims at making small deformation of the end face of the purge space like the end face of a projection optical system in the aligner by which the partial purge was carried out.
[0006]
[Means for Solving the Problem] In the aligner for this invention exposing the pattern of the original edition to a substrate as the 1st composition by the exposure light which emitted light from laser light sources, such as a fluorine excimer laser, in order to attain the above-mentioned purpose Two or more cases which adjoined for the wrap reason and were prepared in a part of optical path [at least] of exposure light, The member of the exposure light-transmission nature prepared in the boundary of a this adjoining case, and the gas supply system which supplies purge gas in each of this case, It is characterized by having the pressure sensor which detects the pressure in each of this case, and the control unit which controls this gas supply system to become a predetermined pressure about the pressure in each of this case based on the output of this pressure sensor, respectively. Moreover, this invention is an aligner for exposing the pattern of the original edition to a substrate as the 2nd composition by the exposure light which emitted light from laser light sources, such as a fluorine excimer laser. Two or more cases which adjoined for the wrap reason and were prepared in a part of

optical path [at least] of exposure light, The member of the exposure light-transmission nature prepared in the boundary of a this adjoining case, and the gas supply system which supplies purge gas in each of this case, It is characterized by having the control unit which controls this gas supply system so that it may become a predetermined pressure about the pressure in each of this case based on the output of the differential pressure sensor which detects the difference of the pressure in a this adjoining case, and this differential pressure sensor, respectively.

[0007] The composition which has the differential pressure sensor formed as this pressure regulation means between the pressure sensor prepared in each case or two or more cases (for example, direct to the septum of adjoining purge space) and the air-conditioning machine in which introduction of the inert gas to each case and exhaust air of the gas inside each case are possible is mentioned. According to the measurement value by this pressure sensor or the differential pressure sensor, the ratio of the amount of introduction and displacement of an inert gas is adjusted by the control valve, and an air-conditioning machine is operated so that the interior of purge space may serve as a predetermined pressure.

[0008] Two or more purge space can be divided roughly into the optical-system space containing an optical-system member, and the drive-system space containing driving member. The pattern of the lighting optical-system space for irradiating the leading-about optical-system space for carrying out the light guide of the laser light source into equipment and exposure light as optical-system space at the original edition and the original edition can be divided into the projection-optical-system space for projecting on a substrate, and it can divide into the masking-blade space containing substrate stage space and a masking blade including the original edition stage space which includes the original edition stage in which the original edition is carried as drive-system space, and the substrate stage in which a substrate is carried. Thus, by dividing exposure space finely, since purge space can be made small, consumption of an inert gas can be lessened, and employment cost can decrease sharply.

[0009] As an inert gas, N2, helium, etc. can be used to a reticle, a wafer, etc. that what is necessary is just inactive. It is drive-system space, using optical-system space as helium atmosphere especially N2 The combination made into atmosphere is desirable.

[0010] Usually, the internal pressure of projection-optical-system space is controlled so that it may not change with change of atmospheric pressure and internal pressure is maintained uniformly. Therefore, as for the pressure of each purge space, it is desirable to adjust on the basis of the internal pressure of projection-optical-system space.

[0011] Moreover, as for the purge space where high cleanliness is demanded like projection-optical-system space, it is desirable to maintain to a high pressure very smaller than other purge space. This is effective in maintaining space sensitive to cleanliness at high cleanliness. However, since there is a possibility of affecting optical-character ability when a bordering member deforms, it is necessary also by this case to control so that the differential pressure of adjoining purge space becomes a predetermined range.

[0012] A differential region is defined according to the variation of the optical-character ability which can be found from the deformation to the pressure differential of a boundary member (optical-system element), and its deformation. As an example, the boundary section of a certain projection optical system is the plate SiO2 of the board thickness of 3mm of heat. If constituted, the pressure differential should make about 0.05-5 hPas about 0.5 hPas preferably. Since the value of these 0.5hPa(s) changes also with designs of optical system, it cannot be told to 1 **. What is necessary is just to perform as follows the pressure of each part of the wafer stage (W) and reticle stage (R) to the pressure of a projection optical system (P), an illumination system (S), leading-about optical system (T), laser (L), a masking blade (MB), for example in the case of this example (a unit is hPa).

[0013]

[Equation 1]

$$P-0.5<W<P-0.1$$
$$P-0.5<R<P-0.1$$
$$R<S<R+0.5$$
$$S-0.5<T<S-0.1$$
$$T-0.5<L<S$$
$$P-0.5<MB<P-0.1$$

[0014] Furthermore, it becomes possible to carry out data communication of the maintenance information on an aligner to the aligner of this invention through a computer network by forming a display, a network interface, and the computer that performs software for networks. This software for networks makes it possible to acquire information from this database through an external network by offering on a display the user interface for accessing the maintenance database which connects with the external network of the works in which the aligner was installed, and the vender or user of an aligner offers.
[0015] The device manufacture method of this invention is characterized by having the process which installs the manufacturing installation group containing an aligner for [various] processes in a semiconductor plant, and the process which manufactures a semiconductor device by multiple processes using this manufacturing installation group. Furthermore, you may have the process which connects a manufacturing installation group by the Local Area Network, and the process which carries out data communication of the information about at least one set of a manufacturing installation group between a Local Area Network and the external network besides a semiconductor plant. Moreover, or it accesses the database which the vender or user of an aligner offers through an external network and acquires the maintenance information on a manufacturing installation by data communication, data communication is carried out through an external network between semiconductor plants other than a semiconductor plant, and it may be made to perform a production control.
[0016] The semiconductor plant of this invention makes it possible to have the gateway made accessible to the external network outside works, and to carry out data communication of the information about at least one set of a manufacturing installation group to it from the Local Area Network which connects the manufacturing installation group and this manufacturing installation group for [containing the aligner of the above-mentioned this invention / various] processes, and this Local Area Network.
[0017] Maintenance procedure of the aligner of this invention is characterized by having the process which the vender or user of an aligner provides with the maintenance database connected to the external network of a semiconductor plant, the process to which access to a maintenance database is permitted through the external network out of a semiconductor plant, and the process which transmits the maintenance information accumulated at a maintenance database to a semiconductor plant side through an external network.
[0018]
[Example] [Example 1] drawing 1 is F2 concerning this invention. It is the cross section showing an example of the semiconductor aligner which uses an excimer laser as the light source. The reticle stage in which 1 carries the reticle (original edition) by which the pattern was drawn in this drawing, The projection optical system to which 2 projects the pattern on a reticle on a wafer (substrate) (lens-barrel), The wafer stage which 3 carries a wafer and is driven in X, Y, Z, theta, and the direction of a tilt, The lighting optical system for 4 irradiating lighting light on a reticle, the leading-about optical system with which 5 carries out the light guide of the exposure light from the light source to the lighting optical system 4, 6 is F2 which is the light source. The laser section, the masking blade to which 7 shades exposure light so that it may not be illuminated except the pattern space on a reticle, 8 and 9 respectively the exposure optical axis of the reticle-stage 1 and wafer stage 3 circumference A wrap case, helium air-conditioning machine with which 10 adjusts the interior of a lens-barrel 2 and the lighting optical system 4 in predetermined helium atmosphere, 11 and 12 -- cases 8 and 9 -- each interior -- N2 predetermined N2 adjusted in atmosphere an air-conditioning machine -- The reticle load lock and wafer load lock which are used when 13 and 14 carry in a reticle and a wafer in a case 8 and 9 respectively, The reticle hand and wafer hand for 15 and 16 conveying a reticle and a wafer respectively, The reticle alignment mark which uses 17 for the centering control of a reticle, the reticle storage warehouse in which 18 keeps two or more reticles within a case 8, and 19 are the pulley alignment sections which perform pulley alignment of a wafer. helium air-conditioning machine 10 andN2 The air-conditioning machines 11 and 12 are functioning as a gas supply system for supplying the inert gas which is an inactive gas to a reticle or a wafer.

[0019] Drawing 2 is a cross section for explaining pressure regulation of each purge space in the aligner of this example. In this drawing, the feed pipe for 22a supplying helium gas as a purge gas to the lighting optical-system space 27 of the lighting optical-system 4 interior from helium air-conditioning machine 10 and 22b N2 It is N2 as a purge gas to the original edition stage space 28 surrounded by the case 8 from the air-conditioning machine 11. The feed pipe for supplying gas and 22c The feed pipe for supplying helium gas as a purge gas to the lens-barrel space 29 of the projection-optical-system 2 interior from helium air-conditioning machine 10 and 22d are N2 of a gas supply system. It is N2 as a purge gas to the substrate stage space 30 surrounded by the case 9 from the air-conditioning machine 12. It is a feed pipe for supplying gas. The exhaust pipe for 23a exhausting a purge gas from the lighting optical-system space 27 to helium air-conditioning machine 10 conversely and 23b It is a purge gas the original edition stage space 28 N2 The exhaust pipe for exhausting to the air-conditioning machine 11 and 23c The exhaust pipe for exhausting a purge gas from the lens-barrel space 29 to helium air-conditioning machine 10 and 23d are a purge gas from the substrate stage space 30 N2 It is an exhaust pipe for exhausting to the air-conditioning machine 12. 24 is a fine differential pressure gage (differential pressure sensor) which measures the differential pressure of adjoining purge space, 24b measures the differential pressure of the original edition stage space 28 and the lens-barrel space 29, and, as for 24c, 24a measures the differential pressure of the lens-barrel space 29 and the substrate stage space 30 for the differential pressure of the lighting optical-system space 27 and the original edition stage space 28, respectively. Each ******** is directly prepared in the septum of the purge space which each adjoins. The pressure gage with which the pressure gage with which the pressure gage (pressure sensor) with which 25a measures the internal pressure of the lighting optical-system space 27, and 25b measure the internal pressure of the original edition stage space 28, and 25c measure the internal pressure of the lens-barrel space 29, and 25d are pressure gages which measure the internal pressure of the substrate stage space 30. 26 (26a-26c) is SiO2 with a thickness of 3mm. It is a plate (member of exposure light-transmission nature), and it is constituted so that it may be prepared into the optical path of exposure light and the outer wall of each case may not interrupt exposure light. Fluorine compounds, such as calcium-fluoride (fluorite), magnesium, etc. fluoride, are sufficient as the quality of the material of a plate 26. In addition, in this specification, the space containing an optical-system member like the lighting optical-system space 27 and the lens-barrel space 29 was called optical-system space, and the space containing driving member like the original edition stage space 28, the substrate stage space 30, and masking-blade space is called drive-system space. Moreover, the original edition stage space 28 means the space where the substrate stage space 30 includes the wafer stage 3, and masking-blade space includes a masking blade 7 for a reticle stage 1, respectively.

[0020] Hereafter, control of each purge space of this example is explained using drawing 1 and drawing 2 . In this equipment, the lens-barrel space 29 is controlled to be uniformly maintained so that it may not change with atmospheric pressure. Control of the lens-barrel space 29 measures the internal pressure of a lens-barrel 2 by pressure gage 25c, and is performed by adjusting the ratio of the amount of helium introduction of feed-pipe 22c from helium air-conditioning machine 10, and the displacement of exhaust pipe 23c by the non-illustrated control valve based on this measurement value. The control valve is prepared in each air-conditioning machines 10, 11, and 12, has the function which controls the ratio of the amount of supply and displacement of purge gas, and adjusts the pressure of each purge space 27-30. At this time, the purge space where high cleanliness is demanded among each purge space is maintained by the pressure higher than other adjoining purge space. The non-illustrated control unit is performing control of this control valve, for example, a non-illustrated control unit controls a control valve based on the output of each pressure gage 25 a-d.

[0021] The original edition stage space 28 is a non-illustrated control valve so that differential pressure with the lens-barrel space 29 may become within the limits of predetermined by fine differential-pressure-gage 24b prepared in the septum with the lens-barrel space 29, and it is N2. N2 from the air-conditioning machine 11 of feed-pipe 22b The internal pressure is adjusted by adjusting the ratio of the amount of introduction, and the displacement of exhaust pipe 23c. It is N2 at a non-illustrated control valve so that differential pressure with the lens-barrel space 29 may become within the limits of

predetermined by fine differential-pressure-gage 24c which is the same also as for the substrate stage space 30 and by which it was established in the septum with the lens-barrel space 29. N2 of 22d of feed pipes from the air-conditioning machine 12 The internal pressure is adjusted by adjusting the ratio of the amount of introduction, and the displacement of 23d of exhaust pipes.
[0022] The internal pressure is adjusted by adjusting the ratio of the amount of helium introduction of feed-pipe 22a from helium air-conditioning machine 10, and the displacement of exhaust pipe 23a by the non-illustrated control valve so that differential pressure with the lighting optical-system space 27 may become within the limits of predetermined by fine differential-pressure-gage 24a by which the lighting optical-system space 27 was established in the septum with the original edition stage space 28. It is adjusted so that similarly differential pressure with the purge space where a masking blade 7 and the leading-about optical-system space 5 also adjoin, respectively may be made regularity.
[0023] each boundary which the pressure in each case is controlled so that the deformation of the member by differential pressure with the pressure in an adjoining case becomes within limits which do not have significant influence on optical-character ability, and is specifically an optical-system element about a differential region -- it has set according to the variation of the optical-character ability which can be found from the deformation to the pressure differential of member 26a, and b and c, and its deformation, and the pressure differential is adjusted by about 0.5 hPas In this example, the pressure of each part of the wafer stage (W) and reticle stage (R) to the pressure of a projection optical system (P), an illumination system (S), leading-about optical system (T), laser (L), and a masking blade (MB) is controlled to become the following ranges (a unit is hPa).
[Equation 2]
$P-0.5<W<P-0.1$
$P-0.5<R<P-0.1$
$R<S<R+0.5$
$S-0.5<T<S-0.1$
$T-0.5<L<S$
$P-0.5<MB<P-0.1$

[0024] According to this example, even when drive-system space internal pressure is changed by receipts and payments of a wafer, a reticle, etc., only the minute range can be kept high rather than the drive-system space which always adjoins the internal pressure of the lens-barrel space 29 or the lighting optical-system space 27. moreover -- since change of the internal pressure of each purge space can be suppressed to the minimum -- a boundary -- a member -- change of the deformation of 26 a-c can always be suppressed to the minimum Furthermore, since purge space, such as drive-system space, is divided finely, the amount of the inert gas used can be stopped few, and cheap equipment employment is attained. As mentioned above, according to this example, in the aligner by which the partial purge was carried out, deformation of the end face of a projection optical system is made small. Moreover, ranking of the air cleanliness class of each division portion is made, and it becomes possible to maintain the portion most sensitive to a detergency at the highest air cleanliness class. In addition, in this operation form, although the number of the lens-barrel space 29 which is building envelopes of a projection optical system 2 was one, it is not restricted to this. For example, you may purge by dividing the building envelope of a projection optical system 2 into two or more space. In this case, the differential pressure gage which forms a pressure gage in each space of the projection-optical-system 2 interior, and measures differential pressure with adjoining space will be prepared. In addition, when dividing the building envelope of a projection optical system 2 into two or more space, the lens of a projection optical system plays the role of a septum with each space. Moreover, when the scale-factor correcting lens of a projection optical system 2 moves, you may make it divide a building envelope in the space containing a scale-factor correcting lens, and the space containing other lenses.
[0025] In the [example 2] this example, each pressure range is beforehand defined so that differential pressure of each purge space may be made regularity. Therefore, the internal pressure of each purge space is adjusted by pressure gage 25 a-d. Others are the same as that of an example 1.
[0026] According to this example, the internal pressure range of each purge space can be kept constant. And optical-system space can always be kept pure like an example 1 by setting the change field as the

range of desired. Moreover, since a chain is carried out to internal pressure change of the purge space (for example, the original edition stage space 28, masking-blade 7 grade) where the internal pressure of the lighting optical system 4 adjoins and it does not change, fear of the optical-character ability change in the lighting optical system 4 disappears. Moreover, between the housing which constitutes each purge space, and the adjoining housing, the boundary member of exposure light-transmission nature is prepared like the example 1, and exposure light is made to penetrate.

[0027] [Example 3] drawing 3 is F2 concerning this invention. It is the cross section showing an example of the semiconductor aligner which uses an excimer laser as the light source. In this drawing, 20 is a case containing the whole aligner and a lens-barrel 2 and the lighting optical system 4 are formed in this interior. 21 is the case 20 whole N2 It is an air-conditioning machine for making it atmosphere. In this example, it is respectively isolated with the building envelope (drive-system space 31) of a case 20, and the building envelope of a lens-barrel 2 and the lighting optical system 4 is independently adjusted by helium atmosphere.

[0028] Although the internal pressure control method of each purge space in this example is the same as that of examples 1 and 2, since the drive-system space 31 interior is controlled collectively, it can consider as a simple and cheap equipment configuration.

[0029] [The example of a semiconductor production system], next the example of the production system of semiconductor devices (semiconductor chips, such as IC and LSI, a liquid crystal panel, CCD, the thin film magnetic head, micro machine, etc.) are explained. This performs maintenance service, such as trouble correspondence of the manufacturing installation installed in the semiconductor plant, and a fixed maintenance or software offer, using the computer network besides a plant.

[0030] Drawing 4 cuts down and expresses a whole system from a certain angle. 101 are the place of business of the vender (equipment supply maker) which offers the manufacturing installation of a semiconductor device among drawing. As an example of a manufacturing installation, the semiconductor fabrication machines and equipment for [various] processes (assembly equipment, test equipment, etc.) used by the semiconductor plant, for example, the devices for last processes (lithography equipments, such as an aligner, a photo lithography processor, and an etching system, a thermal treatment equipment, membrane formation equipment, flattening equipment, etc.) and the devices for back processes, are assumed. In a place of business 101, it has the host managerial system 108 which offers the maintenance database of a manufacturing installation, two or more operating station computers 110, and Local Area Network (LAN) 109 which connects these and builds intranet. The host managerial system 108 is equipped with the security function to restrict the gateway for connecting LAN109 to the Internet 105 which is the external network of a place of business, and access from the outside.

[0031] On the other hand, 102-104 are the plants of the semiconductor manufacture maker as a user of a manufacturing installation. Plants 102-104 may be the works belonging to a mutually different maker, and may be the works (for example, works for last processes, works for back processes, etc.) belonging to the same maker. In each works 102-104, the host managerial system 107 is formed as two or more manufacturing installations 106, Local Area Network (LAN) 111 which connects them and builds intranet, and supervisory equipment which supervises the operation situation of each manufacturing installation 106, respectively. The host managerial system 107 formed in each works 102-104 is equipped with the gateway for connecting LAN111 in each works to the Internet 105 which is the external network of works. Access becomes possible from LAN111 of each works through the Internet 105 at the host managerial system 108 by the side of a vender 101 by this, and access is [the user restricted by the security function of the host managerial system 108] permitted. The status information (for example, symptom of the manufacturing installation which the trouble generated) which shows the operation situation of each manufacturing installation 106 is specifically notified to a vender side from a works side through the Internet 105, and also maintenance information, such as response information (for example, information, software and data for management which direct the solution for a trouble) corresponding to the notice, and the newest software, help information, is receivable from a vender side. The communications protocol (TCP/IP) currently generally used by the Internet is used for the data

communication between each works 102-104 and a vender 101, and the data communication in LAN111 in each works. In addition, the high dedicated line networks (ISDN etc.) of security can also be used instead of using the Internet as an external network outside works, without the ability performing access from a third person. Moreover, what [not only] a vender offers but a user builds a database, a host managerial system places it on an external network, and you may make it permit access to this database from two or more works of a user.

[0032] Now, drawing 5 is the conceptual diagram which cut down and expressed this whole operation form system from the angle different from drawing 4 . In the previous example, each was what connects two or more user works equipped with the manufacturing installation, and the managerial system of the vender of this manufacturing installation in an external network, and carries out data communication of the production control of each works, or the information on at least one set of a manufacturing installation through this external network. On the other hand, this example connects works equipped with the manufacturing installation of two or more venders, and the managerial system of each vender of two or more of these manufacturing installations in the external network outside works, and carries out data communication of the maintenance information on each manufacturing installation. Among drawing, 201 are a manufacturing installation user's (semiconductor-device manufacture maker) plant, and the aligner 202, the photo lithography processor 203, and the membrane formation processor 204 are introduced into the production line of works as an example the manufacturing installation which performs various processes, and here. In addition, in drawing 5 , although only one plant 201 is drawn, two or more works are similarly connected by network in practice. It connects by LAN206, each equipment in works constitutes intranet, and operation management of a production line is carried out with the host managerial system 205. On the other hand, each place of business of venders (equipment supply maker), such as the aligner maker 210, the photo-lithography-processor maker 220, and the membrane formation equipment maker 230, is equipped with the host managerial system 211,221,231 for performing control maintenance of the device supplied, respectively, and these equip it with the gateway of a maintenance database and an external network, as mentioned above. The host managerial system 205 which manages each equipment in a user's plant, and the managerial system 211,221,231 of the vender of each equipment are connected by the Internet or the dedicated line network which is the external network 200. In this system, if a trouble occurs in one of a series of manufacture devices of a production line, although operation of a production line will stop, a prompt action is possible by receiving the control maintenance through the Internet 200 from the vender of the device by which the trouble occurred, and a pause of a production line can be suppressed to the minimum.

[0033] Each manufacturing installation installed in the semiconductor plant equips a display, a network interface, and the software row for network access by which the store was carried out to storage with the computer which performs software for equipment operation, respectively. As storage, they are an internal memory, a hard disk or a network file server, etc. The above-mentioned software for network access offers the user interface of a screen as shows an example to drawing 6 on a display, including exclusive use or a general-purpose web browser. The operator who manages a manufacturing installation at each works inputs information, such as the model (401) of manufacturing installation, a serial number (402), the subject name (403) of a trouble, a generating day (404), an urgency (405), a symptom (406), the coping-with method (407), and progress (408), into the input item on a screen, referring to a screen. It is transmitted to a maintenance database through the Internet, and the suitable maintenance information on the result is answered from a maintenance database, and the inputted information is shown on a display. Moreover, the user interface which a web browser offers can pull out further the operation guide (help information) with which realizes a hyperlink function (410-412), and, and pulls out the software of the latest version used for a manufacturing installation from the software library which a vender offers, or reference of the operator of works is presented like illustration. [that an operator accesses the still more detailed information on each item]

[0034] Next, the manufacture process of the semiconductor device using the production system which gave [above-mentioned] explanation is explained. Drawing 7 shows the flow of the overall manufacture process of a semiconductor device. The circuit design of a semiconductor device is

performed at Step 1 (circuit design). The mask in which the designed circuit pattern was formed is manufactured at Step 2 (mask manufacture). On the other hand, at Step 3 (wafer manufacture), a wafer is manufactured using material, such as silicon. Step 4 (wafer process) is called last process, and forms an actual circuit on a wafer with lithography technology using the mask and wafer which carried out [above-mentioned] preparation. The following step 5 (assembly) is called back process, is a process semiconductor-chip-ized using the wafer produced by Step 4, and contains like assemblers, such as an assembly process (dicing, bonding) and a packaging process (chip enclosure). At Step 6 (inspection), the check test of the semiconductor device produced at Step 5 of operation, an endurance test, etc. are inspected. A semiconductor device is completed through such a process and this is shipped (Step 7). A last process and a back process are performed at another works of exclusive use, respectively, and maintenance is made by the control maintenance system which gave [above-mentioned] explanation for every works of these. Moreover, also between last process works and back process works, data communication of a production control or the information for equipment maintenance is carried out through the Internet or a dedicated line network.

[0035] Drawing 8 shows the detailed flow of the above-mentioned wafer process. The front face of a wafer is oxidized at Step 11 (oxidization). At Step 12 (CVD), an insulator layer is formed on a wafer front face. At Step 13 (electrode formation), an electrode is formed by vacuum evaporationo on a wafer. Ion is driven into a wafer at Step 14 (ion implantation). A sensitization agent is applied to a wafer at Step 15 (resist processing). At Step 16 (exposure), printing exposure of the circuit pattern of a mask is carried out by the aligner which gave [above-mentioned] explanation at a wafer. The exposed wafer is developed at Step 17 (development). At Step 18 (etching), portions other than the developed resist image are shaved off. The resist which etching could be managed with Step 19 (resist ablation), and became unnecessary is removed. By carrying out by repeating these steps, a circuit pattern is formed on a wafer multiplex. Even if a trouble occurs, quick restoration can be possible for it, and the manufacture device used at each process can raise the productivity of a semiconductor device compared with the former while it prevents a trouble, since maintenance is made by the control maintenance system which gave [above-mentioned] explanation.

[0036]

[Effect of the Invention] controlling two or more purge space in an aligner to become a predetermined pressure, respectively according to the aligner of this invention according to claim 1 -- the boundary of purge space -- deformation of a member is mitigable moreover, the thing for which the differential pressure of the purge space where it adjoins in an aligner is controlled according to the aligner of this invention according to claim 2 -- the boundary of purge space -- deformation of a member is mitigable

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[Translation done.]

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damages caused by the use of this translation.

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] F2 It is the cross section showing an example of the semiconductor aligner which uses an excimer laser as the light source.
[Drawing 2] It is a cross section explaining pressure regulation of the semiconductor aligner of drawing 1 .
[Drawing 3] F2 It is the cross section showing other examples of the semiconductor aligner which uses an excimer laser as the light source.
[Drawing 4] It is the conceptual diagram which looked at the production system of a semiconductor device from a certain angle.
[Drawing 5] It is the conceptual diagram which looked at the production system of a semiconductor device from another angle.
[Drawing 6] It is the example of a user interface.
[Drawing 7] It is drawing explaining the flow of the manufacture process of a device.
[Drawing 8] It is drawing explaining a wafer process.
[Description of Notations]
A reticle stage, 2:projection optical system (lens-barrel), 3 : 1: A wafer stage, 4: Lighting optical system, 5: Leading-about optical system and 6:F2 The laser section, 7 : [Masking blade,] 8, 9, 20: A case, a 10:helium air-conditioning machine, 11 and 12, and 21:N2 Air-conditioning machine, 13: 15 A reticle load lock, 14:wafer load lock, 16 : A hand, 17: A reticle alignment mark, 18:reticle storage warehouse, 19 : The pulley alignment section, 22 (22a-22d) : An inlet pipe, 23(a [23]-23d):exhaust pipe, 24(24a-24c): A fine differential pressure gage, 25(25a-25d):pressure gage, 26(26a-26c):boundary member, 27:lighting optical-system space, 28:original-edition stage space, 29:lens-barrel space, 30: Substrate stage space.

[Translation done.]

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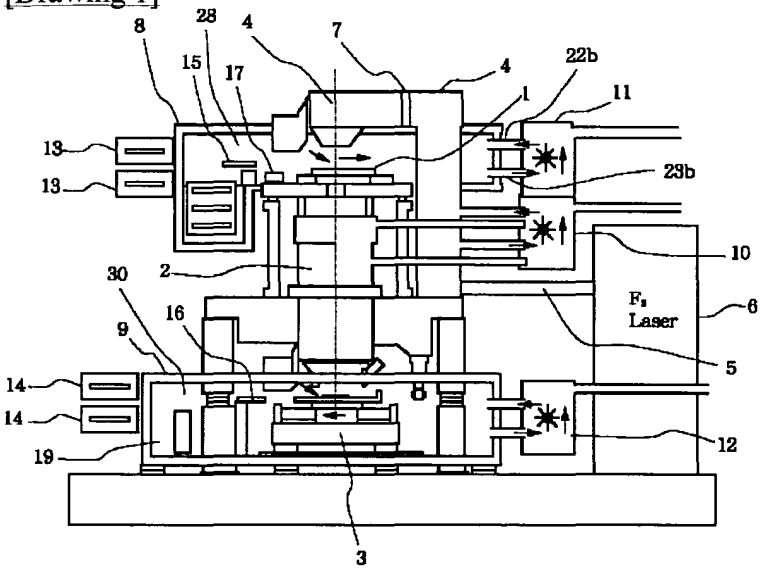
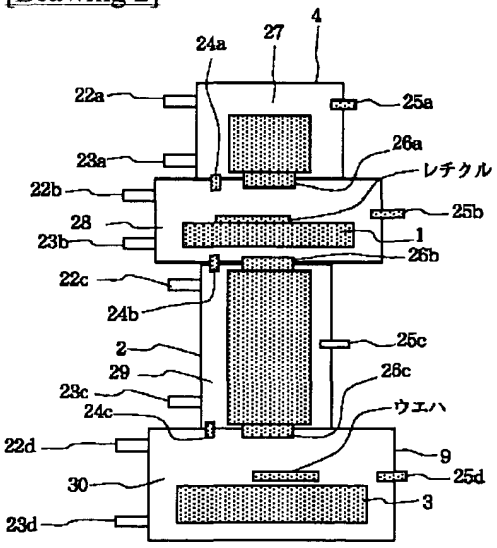
DRAWINGS

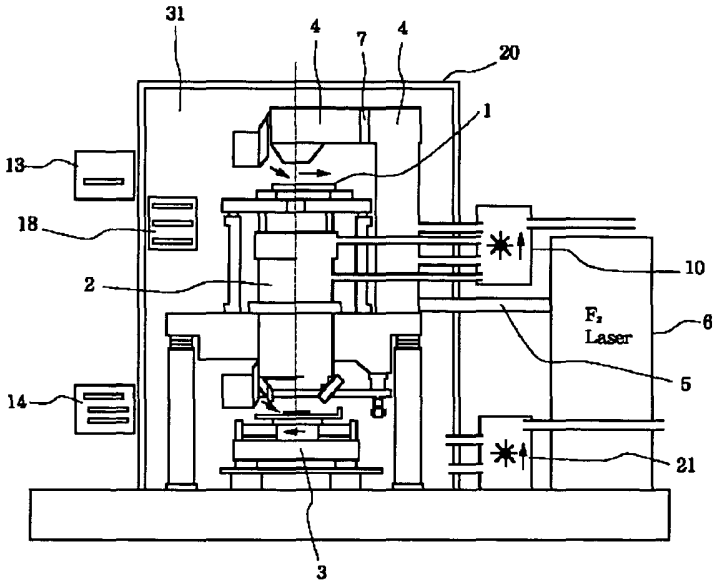
[Drawing 1]



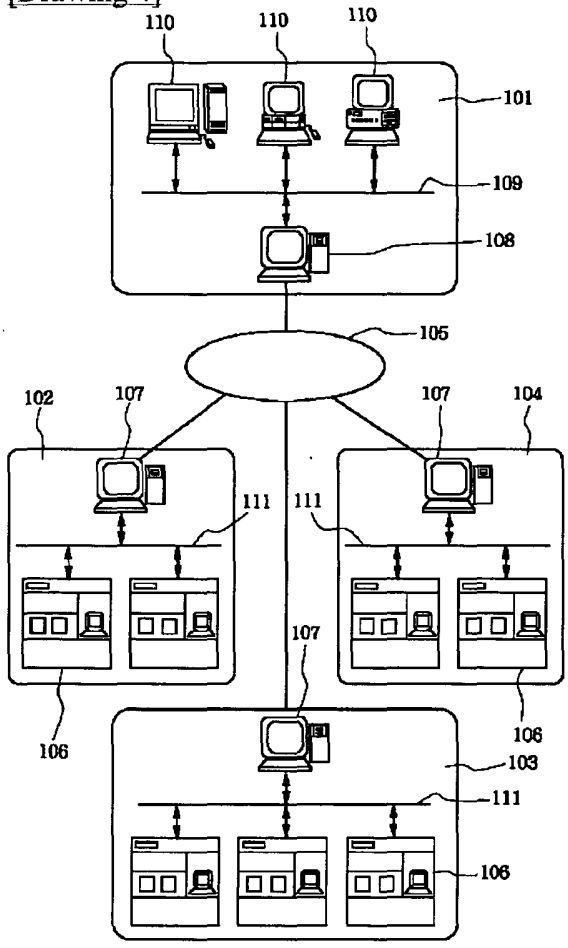
[Drawing 2]



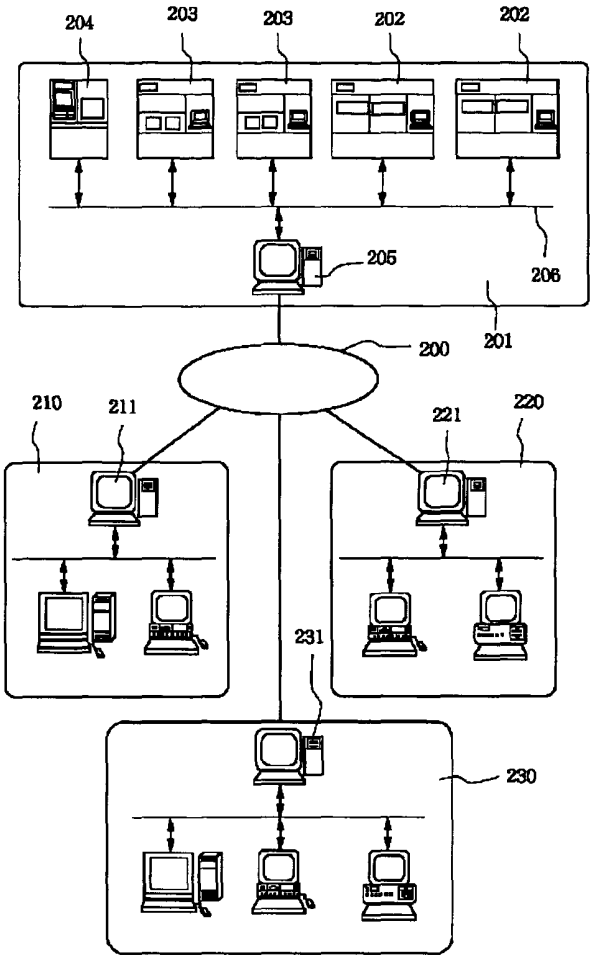
[Drawing 3]



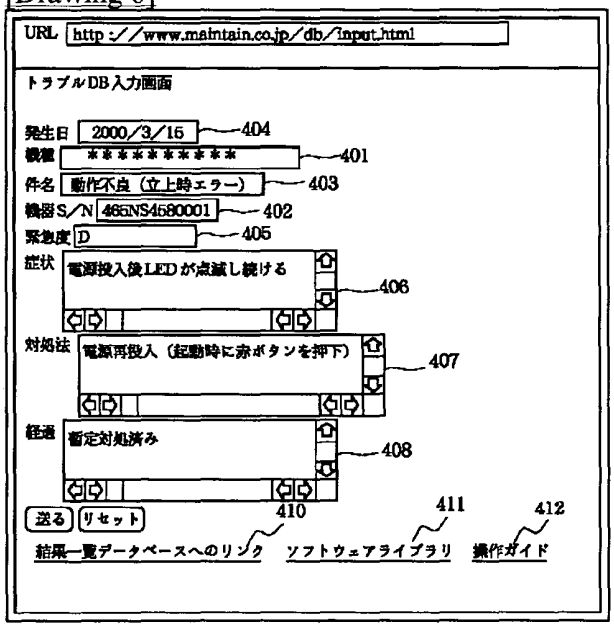
[Drawing 4]



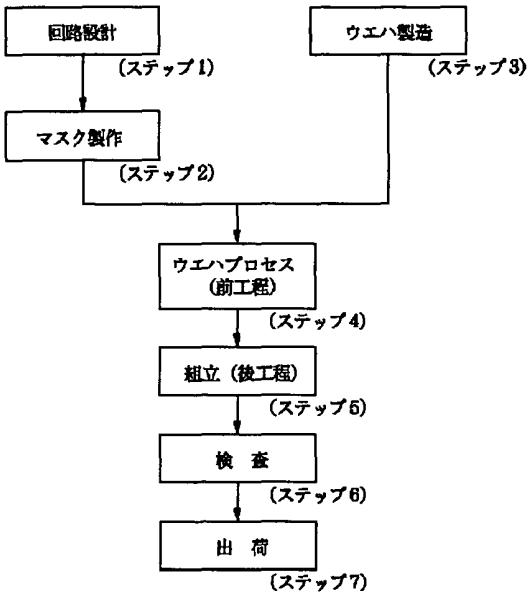
[Drawing 5]



[Drawing 6]

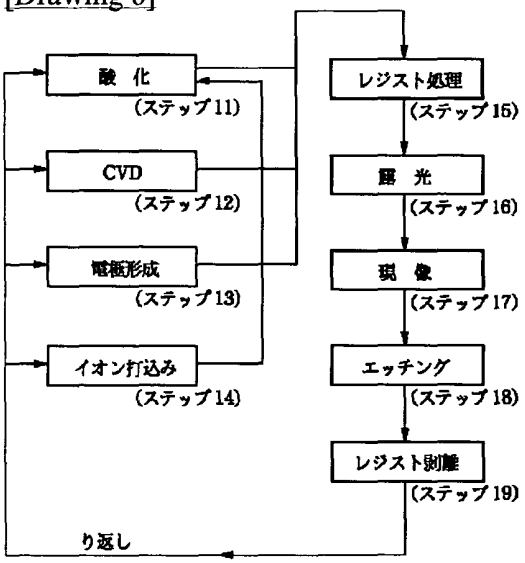


[Drawing 7]



半導体デバイス製造フロー

[Drawing 8]



ウエハプロセス

[Translation done.]